

Twenty-first Session of the Scientific Advisory Committee
on the Acid Deposition Monitoring Network in East Asia
26-28 October 2021, Virtual Meeting

THE SECOND REVISION OF SUMMARY OF THE TWENTIETH ANNIVERSARY OF THE EANET

I. INTRODUCTION

1. This document is provided to consider the adoption of the second revision of the Summary of Twentieth Anniversary of the EANET. It is prepared in line with the approved “Proposed Next Steps after the Twenty-second Session of the Intergovernmental Meeting (IG22) on Acid Deposition Monitoring Network in East Asia (EANET)” (EANET/IG 22/10) and “The Decisions of IG22”.
2. The “Second Revision of the Summary of the Twentieth Anniversary of the EANET” is presented as an Attachment to this document.

II. BACKGROUND

3. By referring to the recommendations of the Working Group (WG) on Reviewing the Scope of Instrument for the EANET in 2020, the Twenty-second Session of the Intergovernmental Meeting (IG22) on Acid Deposition Monitoring Network in East Asia (EANET) decided to request the Secretariat and the Network Center (NC) to prepare a draft document which summarizes the common understanding of the state of acid deposition problem gained through the EANET 20-years operations for further discussions and scientific inputs from SAC, to finalize it by IG23, with the view that such document would be useful to attract potential partners of EANET.
4. In line with the approved “Proposed Next Steps After IG22” (EANET/IG 22/10), the IG22 tasked the NC and the Secretariat to develop the Summary of the Twentieth Anniversary of the EANET. Following the Decision of the IG22, the NC and the Secretariat drafted the Summary.

III. PURPOSE

5. The purpose of the Summary of Twentieth Anniversary of the EANET is to evaluate the data accumulated by the EANET over the past 20 years from the scientific point of view. It targets policymakers, the general public, and various organizations that may be expected to become EANET partners in the near future. This Summary should provide an easy-to-understand message, reflecting the common understanding of the status of acid deposition in East Asia.

IV. PROGRESS SINCE IG22

6. To date, the NC and the Secretariat have taken some actions (highlighted in grey), as explained in the table below.

Meetings	Dates (2021)	Actions to Be Taken
The LA2 and DC2 meetings for PRSAD4	9 March	The summary draft was considered and discussed during the meeting, and the meeting participants provided relevant comments via email.
	After the LA2 and DC2 meetings for PRSAD4 ~ Before WG1	The NC and the Secretariat have revised the Summary following the comments from participants and submitted the Summary as a WG1 meeting document.
WG1	20-22 April	The progress was reported to WG1, and participants were invited to make comments.
	After WG1 ~ Before the LA3 and DC3 meetings for PRSAD4	The Summary has been revised based on the comments from WG1 accordingly.
the LA3 and DC3 meetings for PRSAD4	4-5 August	The 1st Revision of the Summary was submitted to the session, and participants were invited to comment. No comments were provided.
WG2	18-20 August	The progress was reported to WG2, and participants were invited to make comments. China provided some verbal comments at the meeting on the Summary.
	10 September	Following the verbal comments during WG2, the NFP of China sent their written comments to the NC.
	10 September ~ 7 October	Following the comments from China, the NC has revised the Summary accordingly and sent it to all NFPs for their review.
SAC21	26-28 October	SAC21 is invited to review the Summary, provide comments as appropriate and adopt it accordingly.
IG23	24-25 November	The Summary will be endorsed at IG23

V. ACTIONS REQUIRED

7. The SAC21 is invited to review this report and may wish to consider, discuss, make comments and suggestions, and adopt it as appropriate.

Attachment

**SUMMARY OF THE TWENTIETH ANNIVERSARY OF THE ACID
DEPOSITION MONITORING NETWORK IN EAST ASIA (EANET)**

(1) What is the reason for the establishment of the EANET? What kind of activities has the EANET been implementing?

In 1990s, the concern of acid deposition as one of the serious issues arising from the rapid increase in sulfur dioxide (SO₂) emissions was raised in many East Asian countries, mainly because of the fast growing development of secondary industries. For this reason, the Acid Deposition Monitoring Network in East Asia (EANET) was established in January 2001. In 20 years of its existence, the EANET has been implementing various activities such as Monitoring and Reporting, Data acquisition, Capacity Building, Research and Public Awareness.

- Acid deposition has become a serious issue due to the rapid increase in sulfur dioxide (SO₂) emissions in many East Asian countries since the 1980s, mainly due to the rapid development of secondary industries. The acid deposition problem became more serious in the 1990s due to the increase of nitrogen oxides (NO_x), primarily from the rapid development of the automobile and transportation sectors.
- In 1992, the adopted “Agenda 21” stated that the experience of the Convention on Long-range Transboundary Air Pollution (CLRTAP) needed to be shared with other regions of the world. During the first half of the 1990s, countries in the East Asian region expressed the need to work together on atmospheric environment issues, such as acid deposition. After that, the preparatory phase activities of the EANET started in 1998, and subsequently, the regular phase of the EANET began in 2001. Since then, the EANET has been implementing the following activities:
 - Monitoring wet deposition, dry deposition, soil/vegetation, inland aquatic environment, and catchment;
 - Collection, evaluation, analysis, and provision of monitoring data of acid deposition in Participating Countries;
 - Capacity building on monitoring and research activities of acid deposition and related air pollution issues in Participating Countries;
 - Research activities on acid deposition and related air pollution problems and their

impact on ecosystems; and

- Public awareness activities on acid deposition and related air pollution issues.



Figure 1. Second Intergovernmental Meeting of the EANET (Niigata, 2000)

(2) How has the EANET helped solve acid deposition and related air pollution problems in the East Asian region?

To solve acid deposition and related air pollution problems, the essential action is to understand the current status and trends of acid deposition and related air pollution in the region by referring to monitoring data. The EANET has been providing comprehensive monitoring data in the East Asian region, and continuously expanding its monitoring network in the last 20 years. To support policymakers, the EANET has been regularly producing regional assessment reports based on monitoring results from its activities.

- To solve acid deposition and related air pollution problems in East Asia, it is essential to understand the current status and trends of acid deposition and related air pollution in the region based on monitoring data. For this purpose, the monitoring network covers the whole region, developing long-term and continuous, high-quality data. The EANET has contributed to tackling the issue greatly by managing monitoring data in the East Asian region and expanding its monitoring network for the last 20 years.
- Reliability and traceability of monitoring data are important characteristics of the monitoring network. EANET has also prioritized maintaining the quality of the monitoring data by conducting quality assurance/quality control (QA/QC) activities such as developing standard operational procedures (SOPs) and implementing inter-laboratory comparison projects.

Capacity-building programs such as the fellowship program and the individual training program at the EANET Network Center and the dispatch of technical missions to Participating Countries have been conducted to enhance its capabilities further.

- EANET monitoring data are publicly available and can be accessed from the EANET Data Report/Monitoring System (<https://monitoring.eanet.asia/document/public/index>). The data may be used for both research activities and management.
- EANET has been periodically publishing scientific regional assessment reports (Periodic Report on the State of Acid Deposition in East Asia (PRSAD)) based on the results of EANET monitoring activities. The principal objective of the PRSAD is understanding and sharing the status and impacts of acid deposition in East Asia. EANET also periodically publishes the Report for Policy Makers (RPM) to provide policymakers with science-based recommendations for decision-making processes.

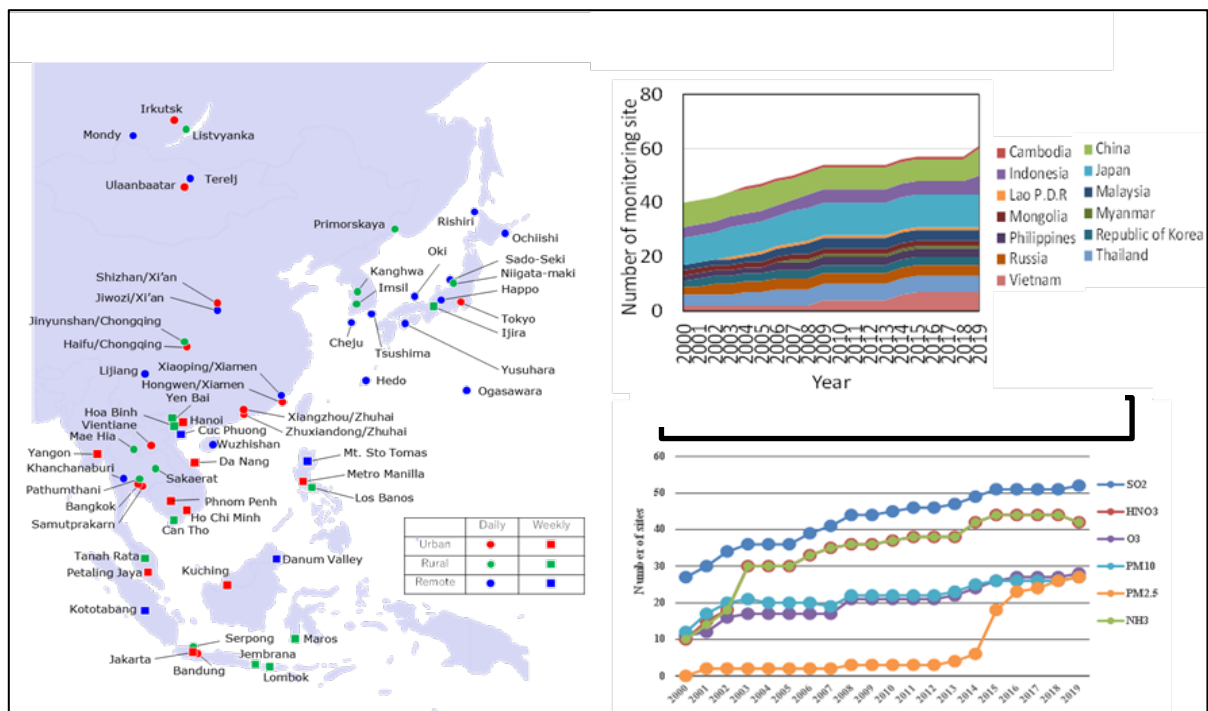


Figure 2. Location of wet deposition monitoring sites in 2019 (left), Numbers of the wet deposition monitoring sites (upper right), and numbers of dry monitoring sites (lower right) in 2000-2019

(Source: EANET; Data Reports 2001-2020)

(3) What is the current status of acid deposition in East Asia?

In Northeast Asia, the annual amount of acid deposition has decreased in the last twenty years, especially because of decrease of sulfuric acid deposition. At the global level, the amount of acid deposition in the EANET is comparatively higher than the amount reported by the European Monitoring and Evaluation Programme (EMEP) in Europe and reported by the National Atmospheric Deposition Program (NADP) in the North America. This may be partly due to volcanic activity and naturally larger precipitation in East Asia.

- In the Northeast Asian region, the wet deposition amount of non-sea-salt sulfate ion (nss-SO₄²⁻) and hydrogen ion (H⁺), which are major (representative/typical) indicators of acid deposition, have decreased remarkably not only in urban but also in rural and remote sites.
- In the Southeast Asian region, large wet deposition of these two species and nitrate ion (NO₃⁻) are prominent at some urban sites, showing regional diversity.
- The amount of wet deposition indicated by these indicators is currently higher than those reported by the EMEP (for Europe) and the NADP (for North America), which do not target urban air pollution. Therefore, a higher amount of acid deposition in the EANET region may be due to urban sites monitoring. Additionally, volcanic activity in Northeast Asia and large precipitation amounts in Japan and Southeast Asia may partially be attributed to the large acid deposition observed in this region.

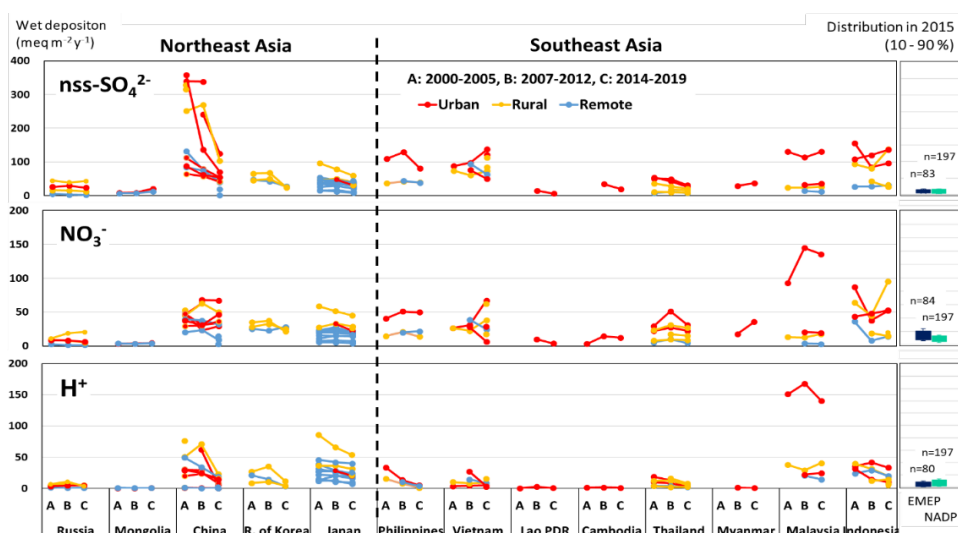


Figure 3. Trends of wet deposition in EANET monitoring sites

(Source: EANET; Data Reports 2001-2020, NADP)

(4) How important is acid deposition as an environmental problem at present?

The acid deposition problem is not only an acidification problem, but also a problem of various other related pollutants, including nitrogen compounds, which deposit together with acidic substances. Excessive nitrogen deposition in addition to acidic substances can influence the health and resilience of eco-systems.

Atmospheric ozone and particulate matters (PMs), generated in connection with the acidic pollutants, can also cause similar adverse effects on ecosystems including crops. It is important to monitor and control the various acid deposition and related air pollutants. With great effort of Participating Countries, the acid deposition problem in the region has been greatly improved. These experiences and best practices accumulated during the past 20 years can contribute to the control and management of other air pollutants.

- The long-term deposition of acidic substances and excessive nitrogen compounds (nitric acid and ammonia) chronically disturb the nutrient cycle of terrestrial ecosystems, such as forests. The resulting decline of tree health and biodiversity may further reduce the resilience of the affected forests. Direct exposure to air pollutants, such as ozone and PM, could also cause similar effects on trees and crops. The loss of ecosystem health and resilience may weaken its carbon-sink function and/or disaster prevention functions, including a water storage function.
- Understanding the impact caused by the acid deposition and the importance of solving this problem, Participating Countries of the EANET have made great efforts to deal with this issue during the past 20 years, and considerable improvement has been achieved. The experiences and best practices accumulated can be drawn as references in controlling and managing other related air pollutants.

(5) How to understand the importance of co-benefits towards a cleaner environment and sustainable development?

The evidence suggests that the climate change and atmospheric issues are likely to be solved simultaneously if coordinated measures and actions from the governments, enterprises and the public are undertaken, with consideration on co-benefits during the design and implementation of related strategies.

- Policies and actions considering climate as their primary objective could lead to more impactful results in solving atmospheric issues if co-benefits coordination is better organized.
- The Intergovernmental Panel on Climate Change (IPCC) Third and Fourth Assessment Reports distinguish between co-benefits (benefits that are intended by the policymaker) and ancillary benefits (unintended benefits). Under this definition, co-benefits in the climate and air areas are the benefits from policy options intentionally implemented for both climate and atmospheric purposes simultaneously.
- The co-benefits key sectors include but are not limited to energy supply, transportation, buildings, industry, and human settlements and infrastructure. Table 5.1 provides an aggregated but qualitative overview of the potential co-benefits on air pollution that could be realized if certain types of mitigation measures are enacted in different sectors: energy supply-side transformations; technological and behavioral changes in the transport, buildings, and industrial end-use sectors, etc. Promotion of the development of renewable energy and new energy automobiles could contribute to achieving carbon deduction and cleaner air. Reduction of fuel carbon intensity and energy intensity in the transportation sector could reduce urban air pollution. In the buildings sector, retrofits can achieve heating and cooling energy savings and contribute to the co-benefits. A sustainable lifestyle should be encouraged to establish a solid base for climate adaption and a cleaner atmospheric hemisphere with improved consumption patterns of the present and future generations in the region.

Table 5.1. Potential co-benefits and adverse side-effects that could be realized if certain types of mitigation measures are enacted in different sectors

Sectoral Mitigation Measures	Effect on Environment
Energy Supply	
Nuclear replacing coal power	Ecosystem impact via air pollution (m/h) and coal mining (l/h)
Renewable energy (wind, photovoltaic (PV), concentrated solar power (CSP), hydro, geothermal, bioenergy) replacing coal	Ecosystem impact via air pollution (except bioenergy) (m/h)
Transport	
Reduction of fuel carbon intensity: electricity, hydrogen (H ₂), compressed natural gas (CNG), biofuels	Ecosystem impact of electricity and hydrogen via urban air pollution (m/m)
Reduction of energy intensity	Ecosystem and biodiversity impact via reduced urban air pollution (m/h)
Compact urban form and improved transport infrastructure Modal shift	Ecosystem impact via reduced urban air pollution (r/h)
Journey distance reduction and avoidance	Ecosystem impact via urban air pollution (r/h)
Buildings	
Fuel switching, incorporation of renewable energy, green roofs, and other measures reducing GHG emissions intensity	Health impact in residential buildings via outdoor air pollution (r/h), indoor air pollution (r/h)
Retrofits of existing buildings (e.g., cool roof, passive solar, etc.) Exemplary new buildings efficient equipment	Health impact via outdoor air pollution (r/h), indoor air pollution (r/h)
Industry	
Material efficiency of goods, recycling	Ecosystem impact via reduced local air and water pollution and waste material disposal (m/m)
Human Settlements and infrastructure	For co-benefit of compact urban form and improved transport infrastructure, see also Transport
Increased accessibility	Air quality and reduced ecosystem and health impacts (m/h)
Mixed land use	Air quality and reduced ecosystem and health impacts (m/h)

(Source: (Source: P469-471, main report, IPCC AR5 Mitigation)

(6) What are the most important issues related to air pollution, and why do air pollution matters need to be assessed in East Asia?

Impacts of air pollution on public health and ecosystems remain a significant concern in East Asia. Research about human health and possible impacts of particulate depositions on tree species and atmospheric ozone pollution on agricultural production have been developed in East Asia.

Recent studies suggest the complexity of atmospheric behaviors of air pollutants and those effects. Assessment on effectiveness of various measures contributing to emission reduction of acid deposition and related air pollution considering the adverse effects caused by multiple air pollutants is necessary, which could lead to applicable measures to further improve the air quality.

- Air pollution is a significant concern in the East Asia region. The main substances affecting public health are nitrogen oxides (NO_x), sulfur dioxide (SO₂), atmospheric ozone (O₃), and PMs. Epidemiological studies have indicated that bronchitis symptoms for children were associated with long-term exposure to Nitrogen Dioxide (NO₂). SO₂ can affect the respiratory system and functions of the lungs and causes eye irritation. Excessive O₃ exposure can cause breathing problems, aggravate asthma, and reduce lung functions. In recent years, fine particles (PM_{2.5}) have been of significant concern, as these tiny particles penetrate deeply into the lungs, affecting both the respiratory and vascular systems.
- Some air pollutants also cause adverse effects on ecosystems. Possible impacts of PMs depositions on tree species have been reported in East Asia. Occlusion of stomata due to deposited particles may occur, resulting in accelerating water loss from the leaf surface. O₃ poses a potential threat for agricultural production, regardless of differences in estimated losses among the various studies undertaken. As a result, it could adversely affect food supply and biodiversity. Therefore, considering adverse impacts on human health and the ecosystem, the most important issue is to reduce acid deposition and related air pollution to improve air quality.
- Recent studies suggested the complexity of atmospheric behaviors of air pollutants and those effects. It was pointed out that reducing emissions of SO₂, the precursor of sulfate aerosol, would increase the amount of sunlight reaching the ground and affect the climate. It was also suggested that excessive PMs reduction might increase O₃ since aerosol plays an important role in the O₃ loss process. It is important to establish a framework to deal with adverse effects caused by multiple air pollutants.
- During the past 20 years, Participating Countries of the EANET have made great efforts to

reduce emissions of acid deposition and related pollutants through methods such as effective policies, advanced technologies, and best practices. Therefore, assessing the effectiveness of various measures contributing to an emission reduction of acid deposition and related air pollution considering the adverse effects caused by multiple air pollutants is necessary, leading to applicable measures to further improve air quality.

(7) How will the EANET activities change in the future?

The EANET could expand its scope from current activities focusing on monitoring acid deposition to atmospheric environmental substances and related activities, subject to the approval of all Participating Countries.

The EANET could continuously enhance and strengthen cooperation and collaboration among Participating Countries by introducing new joint projects.

At the same time, the EANET could strengthen its cooperation with relevant international organizations, research institutes, and countries, including the diversification of its funding mechanisms. Subsequently, the EANET could flexibly deal with atmospheric environmental problems and exert synergistic effects in the East Asian region.

- The EANET has been monitoring acid deposition in East Asia since 2001. However, as described previously, due to recent air pollution problems caused by PM_{2.5} and O₃, impacts on human health and ecosystems are a significant concern in the East Asian region. Considering this current situation, the EANET is discussing the expansion of its scope from focusing on monitoring of acid deposition to atmospheric environmental substances and related activities. The Decision of the Twenty-second Session of the Intergovernmental Meeting on the EANET (IG22) stated that some activities relating to air pollution is of major interest to Participating Countries of the EANET but may be beyond the current scope of the EANET. Therefore, it was decided to start to expand the scope of the Instrument for Strengthening the Acid Deposition Monitoring Network in East Asia.
- The EANET will continuously enhance and strengthen cooperation and collaboration by introducing new joint projects among Participating Countries such as the policy dialogue and capacity building activities of PM_{2.5} and/or O₃ and study on effects of air pollution on agricultural crops, forest ecosystems, and inland water systems in order to improve the atmospheric environment in the East Asian region.

- At the same time, the EANET will strengthen cooperation with relevant international organizations, research institutes, and countries, including by diversifying its funding mechanisms, subject to the approval of all Participating Countries, so that the EANET can flexibly deal with atmospheric environmental problems and exert synergistic effects in the East Asian region. The relevant organizations and initiatives/programmes to cooperate may include the Asia Pacific Clean Air Partnership (APCAP), the Integrated Programme for Better Air Quality in Asia (IBAQ), the North-East Asia Clean Air Partnership (NEACAP), EMEP, and Working Group on Effects (WGE) under the Convention on Long-range Transboundary Air Pollution (CLRTAP), Climate and Clean Air Coalition (CCAC), World Meteorological Organization (WMO), World Health Organization (WHO) and so on.

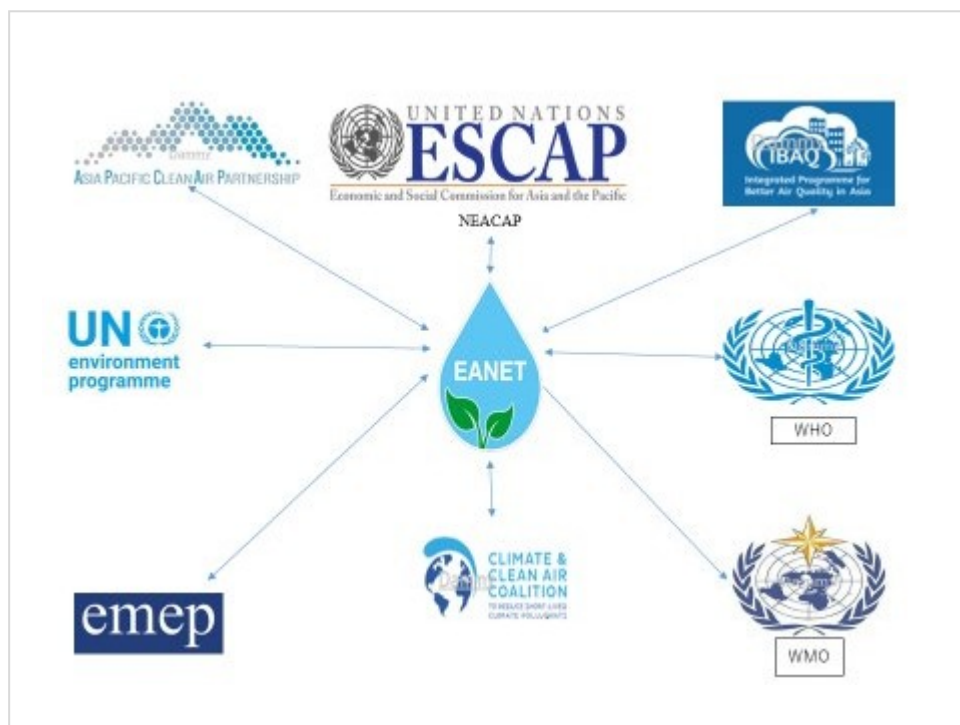


Figure 7. Strengthening Cooperation with other Related International Organizations and Initiatives/Programmes